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IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of: George HRADIL	Confirmation No.: 7882
Application No.: 10/763,979	Group Art Unit: 1753
Filing Date: January 22, 2004	Examiner: Edna Wong
For: ELECTROPLATING SOLUTION CONTAINING ORGANIC ACID COMPLEXING AGENT	Attorney Docket No.: 81394-499

RESPONSE TO NOTIFICATION OF NON-COMPLIANT APPEAL BRIEF

Mail Stop Appeal Brief - Patents
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Sir:

In response to the Notification of Non-Compliant Appeal Brief ("the Notification") mailed on September 8, 2006, Appellant herewith submits an Amended Appeal Brief. As required in the Notification, the Amended Appeal Brief includes a concise explanation of the subject matter defined in each of the independent claims involved in the appeal and separate headings for each ground of rejection on appeal.

No fees are believed to be due for this submission. Should any fees be required, please charge such fees to Winston & Strawn LLP Deposit Account No. 50-1814.

Respectfully submitted,

Date: 9/19/06

for: Allan A. Fanucci (Reg. No. 57,073) (Reg. No. 30,256)

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Express Mail No. EV 346 796 204 US

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of: George HRADIL	Confirmation No.: 7882
Application No.: 10/763,979	Group Art Unit: 1753
Filing Date: January 22, 2004	Examiner: Edna Wong
For: ELECTROPLATING SOLUTION CONTAINING ORGANIC ACID COMPLEXING AGENT	Attorney Docket No.: 81394-499

AMENDED APPEAL BRIEF

Mail Stop Appeal Brief - Patents
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Sir:

Appellant appeals to the Board of Patent Appeals and Inteferences (the "Board") from the decision of the Examiner mailed February 22, 2006 finally rejecting claims 1-20, of which claims 1-18 and 20 have been cancelled and replaced with claims 21-37.

1. REAL PARTY IN INTEREST

The real party in interest is Technic, Inc., a Rhode Island corporation having a place of business at 1 Spectacle Street, Cranston, RI 02910, the assignee of the entire right, title, and interest in the invention described and claimed in the above-identified patent application. The invention was assigned by George Hradil to Technic, Inc. The assignment was recorded on January 22, 2004 at reel 014933, frame 0932.

2. RELATED APPEALS AND INTERFERENCES

Appellant and his legal representatives are not aware of any appeal or interference that directly affects, will be directly affected by, or will have a bearing on the Board's decision in this appeal.

3. STATUS OF CLAIMS

Claims 1-20 were submitted upon filing of this application. In an Office Action dated November 9, 2005, claims 1-20 were rejected for indefiniteness and as being unpatentable over Japanese Patent Application No. 2-301588 ("JP '588"). The claims were amended in an amendment dated January 9, 2006. A final Office Action was mailed on February 22, 2006, rejecting claims 1-20 as being unpatentable over JP '588. In an amendment filed under Rule 116 on April 13, 2006, claims 1-18 and 20 were cancelled, claim 19 was amended, and claims 21-37 were added. Further amendments were made to these claims on April 25, 2006, May 1, 2006, May 22, 2006 and June 8, 2006. In Advisory Actions dated May 10, 2006, May 31, 2006 and June 22, 2006, the amendments submitted on May 1, 2006, May 22, 2006 and June 8, 2006 were indicated to be entered for purposes of appeal but rejected as being unpatentable over JP '588. The Advisory Action of May 10, 2006 also rejected claims 27-28 and 33 for indefiniteness and objected to claim 35 for an informality, but these rejection and objection were withdrawn based on a subsequent amendment. Claims 19 and 21-37, a copy of which is presented in Appendix A, are being appealed.

4. STATUS OF AMENDMENTS

As noted, an amendment under Rule 116 was filed on April 13, 2006, canceling claims 1-18 and 20 and adding claims 21-37. Claims 21-31 and 33-37 were added as rewritten versions of claims 2-12 and 17-19. Claim 19 was rewritten in independent form and claim 32 was added with similar content in Jepson form. The amendments were made to expedite the prosecution of the application and to reduce the issues for appeal. Further amendments to claims 19, 23-25, 27, 29, 32, and 36 were submitted on April 25, 2006. In Advisory Actions dated April 21, 2006 and April 28, 2006, the Examiner indicated that the amendments would not be entered as raising new issues for further consideration. In response, claims 25, 27, 29, and 36 were further amended in an amendment filed on May 1, 2006. In an Advisory Action dated May 10, 2006, the Examiner

indicated that the amendments were entered for purposes of appeal, but rejected the claims as being unpatentable over JP '588. Claims 27-28 and 33 were additionally rejected for indefiniteness and claim 35 was objected to for an informality, but these rejection and objection were withdrawn in a subsequent Advisory Action dated May 31, 2006, after further amendments were made to claims 27, 33, and 35 on May 22, 2006. In an amendment filed June 8, 2006, claims 19, 31-32 and 37 were further amended. The Examiner indicated that the amendments were entered for purposes of appeal in an Advisory Action dated June 22, 2006, but maintained the rejection of all pending claims as being unpatentable over JP '588. Accordingly, claims 19 and 21-37 remain rejected and are the subject of this appeal.

5. SUMMARY OF CLAIMED SUBJECT MATTER

The present invention relates to a novel method for electroplating a metal deposit on a composite substrate having electroplatable and non-electroplatable portions.

Independent claim 19 is directed to a method for electroplating a metal deposit on a composite substrate having electroplatable and non-electroplatable portions by contacting a plurality of substrates with a solution. (*See* specification at p. 3, lines 1-2, 18-21; p. 4, line 28 to p. 5, line 6). The solution comprises water; a metal ion in an amount sufficient to provide a metal deposit on a platable substrate; a complexing agent of an organic compound having between 4 and 18 carbon atoms which compound includes at least two hydroxyl groups and a five or six membered ring that contains at least one oxygen atom, with the compound being present in an amount sufficient to complex the metal ion to render it soluble in the solution and to inhibit oxidation of the metal ion; and a pH of the solution in the range of between 3.5 and 5.5, adjusted, if necessary, by the addition of a suitable pH adjusting agent. (*See id.* at p. 3, lines 2-14). The complexing agent and the metal ion are present in a concentration ratio of between about 2:1 and 9:1 to reduce or minimize agglomeration of the substrates during electroplating. (*See id.* at p. 3, lines 14-16; p. 6, line 26 to p. 7, line 5). When a current is passed though the solution, the method recited in claim 19 provides metal electrodeposits on the substrates without causing significant agglomeration of such substrates during the electroplating. (*See id.* at p. 3, lines 15-17; p. 4, lines 10-20; p. 6, line 26 to p. 7, line 2; Examples 3-5).

Independent claim 32 is directed to an improvement in a method for electroplating a metal deposit on a substrate having electroplatable and non-electroplatable portions by

contacting a plurality of such substrates with a solution. (*See id.* at p. 2, lines 11-26; p. 3, lines 1-2, 18-21; p. 4, line 28 to p. 5, line 6). The improvement comprises formulating a solution comprising water; a metal ion in an amount sufficient to provide a metal deposit on a platable substrate; a complexing agent of an organic compound having between 4 and 18 carbon atoms which compound includes at least two hydroxyl groups and a five or six membered ring that contains at least one oxygen atom, with the compound being present in an amount sufficient to complex the metal ion to render it soluble in the solution and to inhibit oxidation of the metal ion; and a pH of the solution in the range of between 3.5 and 5.5, adjusted, if necessary, by the addition of a suitable pH adjusting agent. (*See id.* at p. 3, lines 2-14). The complexing agent and the metal ion are present in a concentration ratio of between about 2:1and 9:1 to reduce or minimize agglomeration of the substrates during electroplating, so that significant agglomeration of such substrates is avoided when a current is passed though the solution to provide the metal electrodeposits on the substrates. (*See id.* at p. 3, lines 14-17; p. 4, lines 10-20; p. 6, line 26 to p. 7, line 5; Examples 3-5).

Agglomeration during electroplating has been a common and persistent problem in the art. (*See id.* at p. 2, lines 9-18). Small substrates with flat surfaces tend to cluster together during plating, and it is not uncommon that up to 10% of the load is coupled or fused during barrel plating of surface mount technology (SMT) components. Under some conditions, the entire load fuses together in large lumps. Agglomeration is known to be particularly pronounced in tin-lead alloy electroplating, especially for substrates of relatively small size. This agglomeration problem has not been addressed by existing solutions for electroplating composite substrates, which are provided at a neutral or near neutral pH to protect sensitive, non-electroplatable portions of composite substrates. (*See id.* at p. 2, lines 19-23).

Many SMT components have electroplatable metal portions and sensitive non-electroplatable portions made of ceramic, glass, or plastic. Because sensitive portions can be damaged by highly acidic or highly alkaline solutions, electroplating solutions having a neutral or near neutral pH have been developed to avoid damage to sensitive portions. (*See id.* at p. 1, lines 23-26).

One such solution is disclosed in Japanese Patent Application Publication No. H02-301588 ("JP '588"), which relates to the use of a complexing agent such as ascorbic acid, 2-ketogluconic acid, sorbitol, sorbose, glucose, and glucuronic acid in a tin-lead plating bath.

JP '588 mentions generally that the pH of the plating bath is 2 to 9, more preferably 3 to 8.5, and most preferably 5 to 8. However, only a pH of 6 to 7.5 is used in the examples. Moreover, JP '588 does not address the agglomeration problem during plating, and makes no disclosure or suggestion of the claimed concentration ratio of complexing agent and metal ion.

By contrast, the method defined in claims 19 and 32 avoids significant agglomeration of substrates during electroplating by providing the complexing agent and the metal ions in the specific concentration ratio of between about 2:1 and 9:1. (*See* specification at p. 3, lines 11-14). Advantageously, it has been also found that such solution is compatible with sensitive portions of composite substrates at a pH range of 3.5 to 5.5 and allows the metal ions to be deposited on the metallic portion of the substrate without adversely affecting the inorganic portion. (*See id.* at p. 7, lines 14-21). This result is surprising because solutions having a neutral or near neutral pH have been generally preferred over more acidic or alkaline solutions to avoid damage to the sensitive non-electroplatable portion. Thus, despite departing from this general practice, the claimed method surprisingly and advantageously enables electrodeposit of composite substrates with reduced or minimized agglomeration, while also being compatible with sensitive non-electroplatable portions of substrates at a pH range that has been known to be more adverse to non-electroplatable portions than a neutral or near neutral pH.

6. PATENTABLE CLAIM GROUPINGS

Appellant submits that there is one patentably distinct embodiment defined by the present claims, namely:

Group I: a process for electroplating a metal deposit on a substrate, as defined by claims 19 and 21-37.

7. GROUNDS OF REJECTION TO BE REVIEWED ON APPEAL

Claims 19 and 21-37 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Japanese Patent Application No. 2-301588.

8. ARGUMENT

A. Rejection Under 35 U.S.C. § 103(a) Over JP 2-301588

In the final Office Action and the subsequent Advisory Actions, the Examiner rejected Appellant's claims as being unpatentable over JP '588 on the grounds that JP '588 allegedly discloses the use of a similar electroplating solution such that the process can reasonably be expected to yield similar results. The Examiner has taken the position that the solution disclosed in JP '588 is similar to the one used in the claimed method such that Appellant only has a different reason for, or advantage resulting from, doing what the prior art has suggested. Regarding the criticality of the recited pH range and concentration ratios, the Examiner has taken the position that the recitations are obvious in view of JP '588's broad disclosures of pH range and amounts of complexors and metal ions that encompass the recitations.

Appellant respectfully submits that the Examiner's position is incorrect and that JP '588 does not render the claims obvious at least because JP '588 does not disclose or suggest a method for electroplating a metal deposit using a solution having the claimed complexing agent-metal ion concentration ratios and the claimed pH range. Therefore, the Examiner's final rejection is in error and should be reversed.

i. The Recited Concentration Ratio of Complexing Agent to Metal Ion Is Not Obvious in View of JP '588

The Examiner has alleged that the preferred ranges of complexor and metal ion amounts disclosed in JP '588 include ratios that overlap with the recited ratio of between about 2:1 and 9:1, because JP '588 discloses that the tin and the lead ion concentration used in the solution is in the range of 0.5-200 g/l, preferably in the range of 1-100 g/l, and the amount of complexors in the solution is in the range of 3-800 g/l, preferably 40-400 g/l. (*See* Office Action dated February 22, 2006, p. 4). The Examiner has alleged that the preferred ranges of metal ions and complexors would have led a skilled artisan to use a value within the recited range of concentration ratios and stated that Appellant only "has a different reason for, or advantage resulting from doing what [JP '588] has suggested." (*Id.*).

Appellant respectfully submits that the Examiner's statements are incorrect. JP '588 discloses that "[t]in and lead ion concentration can be selected arbitrarily, normally in the range

of 0.5-200 g/l, but preferably in the range of 1-100 g/l." JP '588 also discloses that the quantity of the complexors "may vary but normally in the range of 3-800 g/l, and preferably in 40-400 g/l." Thus, JP '588 only generally discloses amounts of the metal ions and complexors that can be used in the solution. A specific relative ratio of the two components is nowhere disclosed or suggested in JP '588. The general disclosure of the amounts of metal ions and complexors, which can be selected arbitrarily, is not a disclosure or suggestion to use these two components in any specific relative concentration ratio.

Further, even if the amounts of metal ions and complexors disclosed in JP '588 were to be construed as a suggestion to use the components in a certain relative ratio, which they are not, JP '588 fails to suggest the use of complexors and metal ions in the specific recited ratio of between about 2:1 and 9:1. The wide ranges of amounts of complexors and metal ions in JP '588, even if allegedly encompassing the recited ratio, do not provide any suggestion to use the specific ratio of between 2:1 and 9:1, which have been found to provide unexpected reduction of substrate agglomeration during electroplating. Indeed, the concentration ratios of the complexors to metal ions disclosed in the examples of JP '588 far exceed the ratio recited in the present claims, at about 10:1 to 20:1. (*See* JP '588, Examples 1-5).

The criticality and importance of specific relative concentrations of complexing agents and metal ions are explained in the application as well as the Rule 132 declaration submitted by the inventor Dr. George Hradil, dated May 22, 2006 ("Declaration"), a copy of which is annexed hereto in Appendix B. As explained in the declaration, increasing the amount of the complexing agent is known to increase the solubility of the metal components in the solution in general. (*See* Declaration at ¶ 6). However, in a solution prepared with the components disclosed in this application, an increased amount of the complexing agent was found to cause agglomeration of substrates, producing inconsistently plated deposits. (*Id*). Advantageously, it was found that agglomeration was minimized or reduced by providing the complexing agent in a specific concentration ratio to the metal ions such that the complexing agent is present in a limited amount, "just sufficient to complex the metals without providing significant excess amounts." (Specification at p. 6, lines 26-29). Large excesses of free complexing agent must be avoided to prevent agglomeration of substrates during electroplating. (*Id.* at p. 7, lines 1-2). In addition to minimizing the attack of the non-electroplatable portion of composite substrates by free complexing agents in the solution, controlling the ratio of complexor to metal ions to a value

between about 2:1 and 9:1 was found to unexpectedly provide a significant reduction or prevention of substrate agglomeration.

Therefore, the recited ratio of 2:1 to 9:1 is not obvious in view of JP '588, which merely discloses the amounts of metal ions and complexors in wide ranges, and which does not disclose or suggest the use of a concentration ratio of a complexing agent to metal ions between about 2:1 and 9:1 to reduce or minimize substrate agglomeration.

In this regard, the Examiner's statements that the preferred ranges of metal ions and complexors disclosed in JP '588 would have led a skilled artisan to use values in the recited range and that the examples and embodiments disclosed in JP '588 do not constitute a teaching away from a broader disclosure or nonpreferred embodiment are incorrect. (*See* Office Action dated February 22, 2006, at pp. 4-5). As explained above, the wide ranges of the amounts of complexors and metal ions mentioned in JP '588 would not have led a skilled artisan to use a complexor and metal ions in relative concentrations falling within the specific recited ratios. Also as explained above, the examples disclosed in JP '588, all of which have complexor to metal ion concentration ratios outside the recited range, would not have led a skilled artisan to use those components in concentrations falling within the specific recited ratios.

Accordingly, the use of complexors and metal ions in the recited concentration ratios is not obvious in view of JP '588, which neither discloses or suggests the use of such concentration ratios, nor recognizes the criticality of such concentration ratios in reducing or minimizing agglomeration.

ii. The Recited pH Range Is Not Obvious in View of JP '588

The Examiner has alleged that JP '588 teaches preferred pH of 5 to 8, which overlaps with the recited pH range of between 3.5 and 5.5, such that JP '588 would have led a skilled artisan to use values in the recited pH range. (*See* Office Action dated February 22, 2006, at pp. 3-4).

JP '588, however, does not disclose or suggest the criticality of the recited pH range. JP '588 discloses only that the pH of the plating bath is 2 to 9, preferably 3 to 8.5, and most preferably 5 to 8. This disclosure shows preference for a neutral or near neutral pH, which has been typically used to avoid damage to sensitive, non-electroplatable portions of a composite

substrate. The examples in JP '588, which use a pH ranging from 6 to 7.5, also indicate a clear preference for a neutral or near neutral pH for optimal results. Thus, the general disclosure of a wide pH range of 2 to 9 in JP '588 is not a disclosure or suggestion to only use a pH between 3.5 and 5.5. Given the general disclosure in JP '588, and the preference for a neutral or near neutral pH in JP '588, as well as in the art, to avoid damage to sensitive substrates, a person skilled in the art would not have been motivated to use a non-neutral pH such as 3.5 to 5.5, especially considering that such lower pHs were known to be adverse to sensitive substrates and that no criticality or importance was attached to such pH range.

Therefore, the use of a specific pH between 3.5 and 5.5 is not obvious in view of JP '588.

iii. The Combination of the Recited Concentration Ratio and pH Range Is Critical in the Claimed Method and Is Not Obvious in View of JP '588

The Examiner has alleged that the composition of the solution according to the claimed method was disclosed in JP '588 because of disclosure of the preferred pH of 5 to 8 and the wide ranges of metal ion and complexor concentrations allegedly encompassing the recited concentration ratios. The Examiner has thus taken the position that the unexpected advantages of the claimed method are latent properties of an otherwise known invention. (*See* Office Action dated February 22, 2006, at p. 6). Appellant respectfully submits that this position is incorrect.

As discussed above, JP '588 only generally discloses wide ranges of pH and the amounts of the complexors and metal ions that can be used in the plating solution. The use of the specific pH range or the specific ratios of complexor to metal ions as required by the claimed method is not obvious in view of JP '588. As such, JP '588 also fails to disclose or suggest the combination of the pH range and concentration ratios required in the claimed method, or the importance of such combination.

As explained in the specification and during the prosecution history, the specifically required combination of the pH range and the concentration ratios is a critical feature of the claimed method, which allows reduction of substrate agglomeration while also minimizing attack on the non-electroplatable portions of composite substrates during electroplating. The criticality of the present solution is evinced by the choice of pH range and complexor to metal ion concentration ratios that are not conventional or preferred in the prior art.

In particular, it was known in general that increasing the amount of the complexing agent can increase the solubility of metal components in the solution, such that a greater amount of the complexing agent is typically desired. (*See* Declaration at ¶ 6). In the solution according to the claimed method, however, increased amount of the complexing agent was found to cause agglomeration of substrates to be plated, resulting in inconsistent electrodeposits. (*See id.*). Thus, the ratio of complexing agent to metal ion is an important feature of the claimed method to provide desirable plating results while also reducing or minimizing agglomeration.

Further, while an acidic pH such as the recited range has been known to be more adverse to the sensitive, non-electroplatable portion of a composite substrate than a neutral or near neutral pH, the recited pH range of 3.5 to 5.5 was found to be surprisingly compatible with the sensitive portion when used in a solution having a concentration ratio of complexing agent to metal ion between about 2:1 and 9:1. (*See* Specification at p. 8, line 14 to p. 9, line 3). The recited pH range is further critical in view of the findings that a pH below 3.5 renders the solution very aggressive to substrates and that a pH above about 3.5 to 4.5 provides improvement in agglomeration. (*See* Declaration at ¶ 5). The non-conventional pH of 3.5 to 5.5, therefore, was found to be advantageous when used in an electroplating solution having a complexing agent to metal ion concentration ratio of about 2:1 to 9:1. The criticality of the combination of such specific pH and concentration ratio is neither disclosed nor suggested in JP '588, and is surprising in view of the conventional preference for a neutral solution and the long-unresolved need for reducing agglomeration during electroplating.

The criticality of the present electroplating solution is additionally shown in its stability. In particular, when a solution was prepared according to Example 1 of JP '588, the solution became unstable at a pH above 5.5. Precipitation of the metal components was observed as cloudiness or turbidity at pH 6, and significant precipitation of tin hydroxide was formed at pH 7. (*See id.*). Thus, the solution disclosed in JP '588 is not even stable at its allegedly optimal pH. Because of its turbidity and precipitation problems, the solution disclosed in JP '588 is not suitable for commercial use, since it is not possible to obtain useful metal deposits at a commercial scale with such an unstable solution. (*See id.*; Amendment dated May 22, 2006, at p. 10). In contrast, the present solution does not exhibit turbidity or precipitation observed in the solution according to JP '588, and is useful for commercial purposes. Thus, the solution recited

in the claimed method, with its combination of a specific pH range and complexing agent /metal ion concentration ratios, is further distinguished from JP '588 by its superior stability properties.

Therefore, the criticality of the combination of the particular pH range and the complexor-metal ion concentration ratios recited in the claimed method is not disclosed or inherent in JP '588, and a person skilled in the art would not have been led, from the disclosures of JP '588, to make or use such a combination to achieve an improved electroplating process.

9. CONCLUSION

Appellant submits that the disclosures in JP '588 relied upon by the Examiner does not, under 35 U.S.C. § 103(a), render unpatentable the present claims directed to a method for electroplating a metal deposit on a composite substrate using a solution having a pH in the range between 3.5 and 5.5 and a concentration ratio of complexing agent to metal ion between about 2:1 and 9:1, wherein the method does not cause significant agglomeration of substrates during electroplating. Accordingly, Appellant respectfully submits that the rejection is in error and warrants reversal by the Board so that the pending claims may be allowed.

Respectfully submitted,

Date: 9/19/06

for: Allan A. Fanucci (Reg. No. 30,256)

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APPENDIX A -- CLAIMS APPENDIX

The claim on appeal are:

Claims 1 to 18. (Cancelled)

19. (Previously Presented) A method for electroplating a metal deposit on a substrate which comprises contacting a plurality of such substrates with a solution which comprises:

water;

a metal ion in an amount sufficient to provide a metal deposit on a platable substrate;

a complexing agent of an organic compound having between 4 and 18 carbon atoms which compound includes at least two hydroxyl groups and a five or six membered ring that contains at least one oxygen atom, with the compound being present in an amount sufficient to complex the metal ion to render it soluble in the solution and to inhibit oxidation of the metal ion; and

a pH of the solution in the range of between 3.5 and 5.5, adjusted, if necessary, by the addition of a suitable pH adjusting agent;

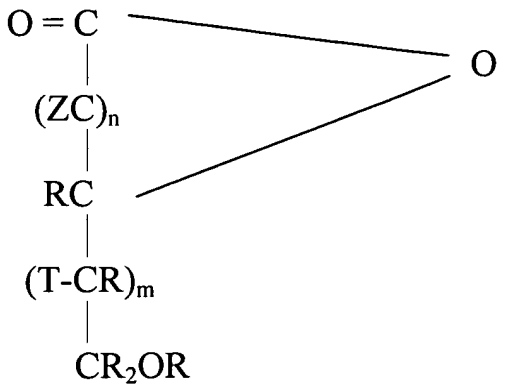
wherein the complexing agent and metal ion are present in a concentration ratio of between about 2:1 and 9:1 to reduce or minimize agglomeration of the substrates during electroplating; and

passing a current though the solution to provide metal electrodeposits on the substrates without causing significant agglomeration of such substrates during the electroplating;

wherein the substrates are composite articles having electroplatable and non-electroplatable portions.

20. (Cancelled)

21. (Previously Presented) The method of claim 19, wherein the complexing agent has the structure:



wherein each R is the same or different and is hydrogen or a lower alkyl group of 1 to 3 carbon atoms, T is R, OR, or $O=P(OR)_2$-, Z is O= or RO-, n is 2-4 and Z can be the same or different in each occurrence in the compound, and m is 1-3, or the complexing agent is a soluble salt of such structure.

22. (Previously Presented) The method of claim 19, wherein the complexing agent is ascorbic acid, isoascorbic acid, dehydroascorbic acid, glucoascorbic acid, galacturonic acid, glucoronic acid, or a salt thereof, or is derived from a ketogluconate or heptagluconate and is present in an amount of about 25 to 200 g/l.

23. (Previously Presented) The method of claim 19, wherein the metal ion is a tin ion and is added to the solution as a stannous alkyl sulfonate salt, a stannous sulfate salt, a stannous chloride salt, a stannous ascorbate salt, or stannous oxide and is present in an amount of between about 5 and 100 g/l.

24. (Previously Presented) The method of claim 23, wherein the metal ion includes a divalent lead salt in an amount sufficient to deposit a tin-lead alloy from the solution.

25. (Previously Presented) The method of claim 19, wherein the solution further comprises a conductivity salt in an amount sufficient to increase the conductivity of the solution.

26. (Previously Presented) The method of claim 25, wherein the conductivity salt is an alkali or alkaline metal sulfate, sulfonate, or acetate compound.

27. (Previously Presented) The method of claim 19, wherein the solution further comprises a surfactant in an amount sufficient to enhance deposit quality and grain structure.

28. (Previously Presented) The method of claim 27, wherein the surfactant is an alkylene oxide condensation compound and is present in an amount of about 0.01 to 20 g/l.

29. (Previously Presented) The method of claim 19, wherein the solution further comprises an agent to promote anode dissolution.

30. (Previously Presented) The method of claim 29, wherein the agent to promote anode dissolution is as potassium methane sulfonate, ammonium chloride or a metal sulfide salt.

31. (Previously Presented) The method of claim 19, wherein the pH adjusting agent is an acid or a base and the pH is adjusted to the range of about 3.5 to 5.5 to enable electroplating of the electroplatable portions of the articles without deleteriously affecting the non-electroplatable portions.

32. (Previously Presented) In a method for electroplating a metal deposit on a substrate by contacting a plurality of such substrates with a solution, the improvement which comprises formulating a solution which comprises:

water;

a metal ion in an amount sufficient to provide a metal deposit on a platable substrate;

a complexing agent of an organic compound having between 4 and 18 carbon atoms which compound includes at least two hydroxyl groups and a five or six membered ring that contains at least one oxygen atom, with the compound being present in an amount sufficient

to complex the metal ion to render it soluble in the solution and to inhibit oxidation of the metal ion; and

a pH of the solution in the range of between 3.5 and 5.5, adjusted, if necessary, by the addition of a suitable pH adjusting agent;

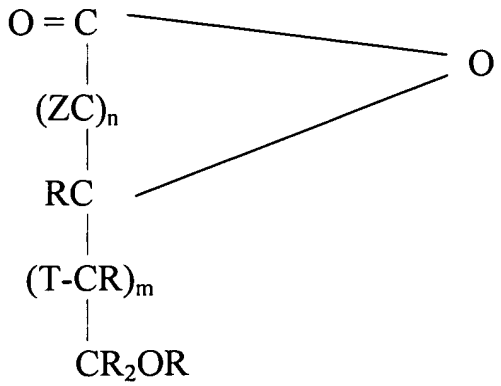
wherein the complexing agent and metal ion are present in a concentration ratio of between about 2:1 and 9:1 to reduce or minimize agglomeration of the substrates during electroplating;

so that significant agglomeration of such substrates is avoided when a current is passed though the solution to provide the metal electrodeposits on the substrates;

wherein the substrates are composite articles having electroplatable and non-electroplatable portions.

33. (Previously Presented) The method of claim 32, wherein the metal ion is a tin ion that is present in an amount of between about 5 and 100 g/l.

34. (Previously Presented) The method of claim 32, wherein the complexing agent is present in an amount of about 25 to 200 g/l and has the structure:



wherein each R is the same or different and is hydrogen or a lower alkyl group of 1 to 3 carbon atoms, T is R, OR, or $O=P(OR)_2$-, Z is O= or RO-, n is 2-4 and Z can be the same or different in each occurrence in the structure, and m is 1-3, or the complexing agent is a soluble salt of such structure.

35. (Previously Presented) The method of claim 32, wherein the complexing agent is ascorbic acid, isoascorbic acid, dehydroascorbic acid, glucoascorbic acid, galacturonic acid, glucoronic acid, glucose-6-phosphate, or a salt thereof, or is derived from a ketogluconate or heptagluconate and is present in an amount of about 25 to 200 g/l.

36. (Previously Presented) The method of claim 32, wherein the solution further comprises one of a conductivity salt of an alkali or alkaline metal sulfate, sulfonate, or acetate compound, or a surfactant of an alkylene oxide condensation compound in an amount of about 0.01 to 20 g/l, or both.

37. (Previously Presented) The method of claim 32, wherein the pH adjusting agent is an acid or a base and the pH is adjusted to the range of about 3.5 to 5.5 to enable electroplating of the electroplatable portions of the articles without deleteriously affecting the non-electroplatable portions.

APPENDIX B -- EVIDENCE APPENDIX

Dr. Hradil Declaration

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of: George HRADIL	Confirmation No.: 7882
Application No.: 10/763,979	Group Art Unit: 1753
Filing Date: January 22, 2004	Examiner: E. Wong
For: ELECTROPLATING SOLUTION CONTAINING ORGANIC ACID COMPLEXING AGENT	Attorney Docket No.: 81394-499

RULE 132 DECLARATION

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Alexandria, VA 22313-1450

Sir:

I, George Hradil, hereby submit the following comments as a person of ordinary skill in the art of the subject matter of this application.

1. I have ScB, MS, and PhD degrees in Chemical Engineering and over 27 years experience in the field electroplating, starting from a technician to a Research Engineer. I am presently employed by Technic, Inc., the assignee of the present application, and am responsible for formulating electrolytes for plating of various metals as well as for troubleshooting and resolving problems in implementing such formulations for our customers.

2. A the inventor, I am familiar with the present invention, its claims and the office actions that include rejections of such claims.

3. The present invention relates to a method for electroplating a metal deposit on a substrate which comprises contacting a plurality of such substrates with a solution that has a particular pH range and that contains a complexing agent and metal ions in a particular

ratio range that provides metal electrodeposits on the substrates without causing significant agglomeration of such substrates during electroplating. The pH of the solution is between 3.5 and 5.5, adjusted, if necessary, by the addition of a suitable pH adjusting agent, to form a stable solution and the complexing agent and metal ion are present in a concentration ratio of between about 2:1 and 9:1 to reduce or minimize agglomeration of the substrates during electroplating.

4. I understand that the claims have been rejected as being unpatentable over Japanese patent application 2-301,588 ("the '588 reference") for the reasons set forth in the final office action and related advisory actions. This reference does not disclose the presently claimed critical combination of pH range and concentration ratios. The pH range is not critical in the '588 reference and can range from between 2 and 9. And while a pH of 3.5 to 5.5 is included within that range, there is no importance or criticality attached to it. Furthermore, the examples of the '588 reference have pHs between 6 and 7.5, and this suggests that optimum performance is found when a near-neutral electroplating solution is used. In contrast, I have found that the solutions of the '588 reference are not stable at such near-neutral pHs.

5. By me or under my direction and control, tests were carried out to repeat Example 1 of the '588 patent. The initial making up of the solution of example 1 resulted in a pH of around 1, and base was added as taught by that example to arrive at a final pH of 7. Photographs were taken at various intermediate pH values to illustrate the condition of the solution, and these are attached. As can be easily seen in these photographs, the solution became unstable at pHs of above 5.5 with precipitation of the metal components being observed initially as cloudiness (at a pH of 6) to a precipitate of tin hydroxide in the beaker at a pH of 7. It is not possible to obtain useful metal deposits with unstable solutions of this type. Also, the solution at a preferred pH in the claimed range, i.e., 5, was completely stable as shown by the clear solution in the beaker.

6. My colleague, George Federman, and I presented a technical paper entitled MINIMIZING COUPLING OF SMALL PASSIVE COMPONENTS IN THE ELECTROPLATING OPERATION at a conference in 2004 to present some of the findings of this invention. This paper also shows why the pH range is critical. In particular, Figures 4 and 5

illustrate that improvements in agglomeration (i.e., less coupling) of the parts to be electroplated) are found at pHs above about 3.5 to 4.5, thus confirming the criticality of the lower end of the presently claimed pH range. Furthermore, solutions having a pH below 3.5 become very aggressive to the components or electronic parts to be plated. Thus, these tests demonstrate the criticality of the presently claimed pH range of between about 3.5 and 5.5.

6. It is known in general that increasing the amount of complexing agent can increase the solubility of the metal components in the solution. In the present invention, however, this is not possible because, as noted in the specification, increased amounts of complexing agent causes agglomeration of the substrates to be plated with inconsistent plated deposits being obtained. Thus, the ratio of complexing agent to metal ion is another important feature of the invention to provide good plating results without causing agglomeration of the substrates.

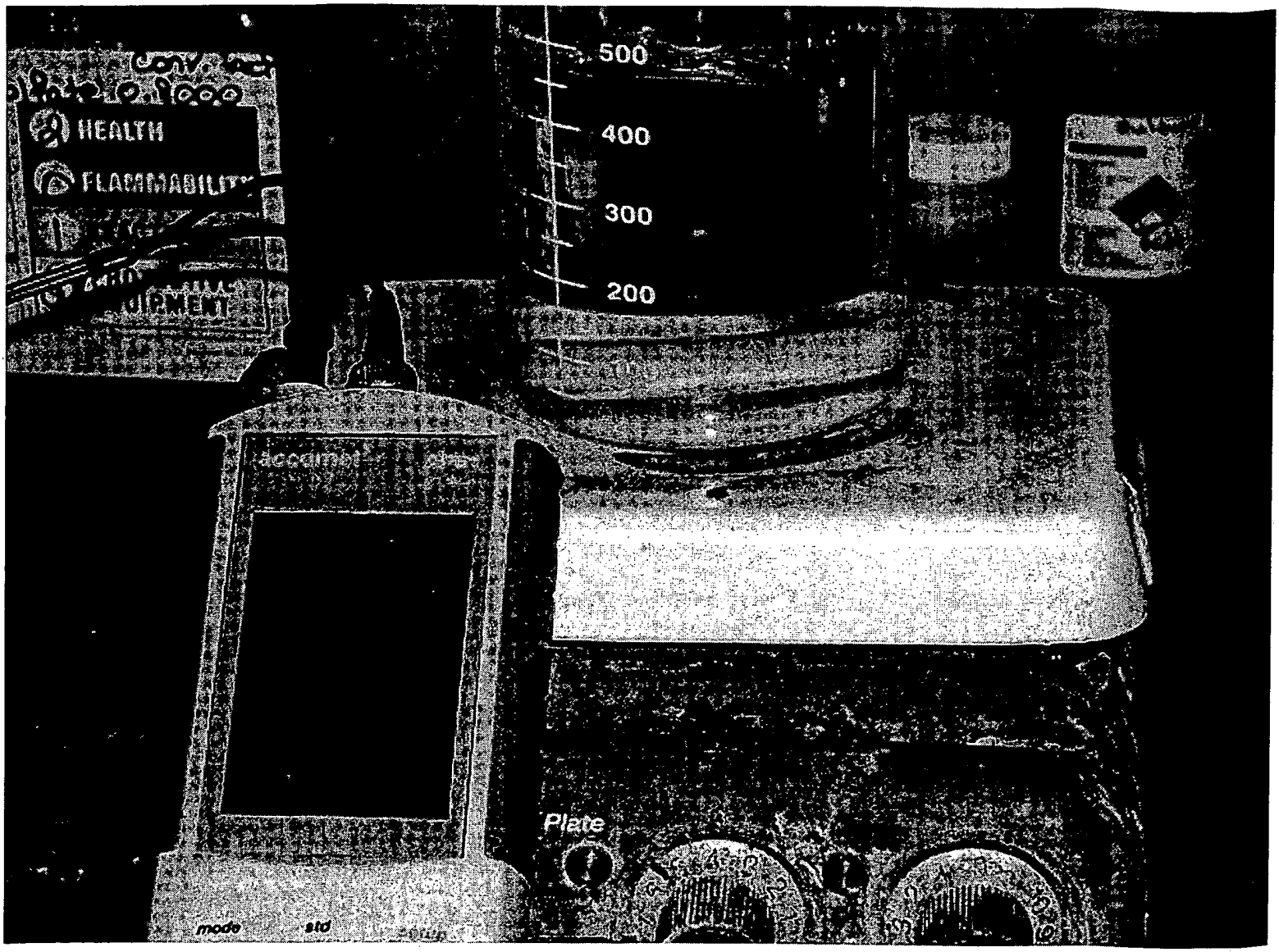
7. The resolution of the problem of substrate agglomeration during electroplating is a significant benefit of the present invention. This is a source of concern to electroplaters worldwide, in particular where relatively small electronic parts are to be plated, and solutions to this problem are needed and desired. Our technical paper (mentioned above) establishes the importance of the concentration ratio in combination with the particular complexing agents defined in the claims for avoiding agglomeration of parts during electroplating. In particular, the present complexing agent based on ascorbic acid (referred to as CeramiStan BR in the paper) the was found to be suitable where other complexing agents based on organic acids such as citric and oxalic acids were not suitable. This data supports the unexpected advantages of the presently claimed complexing agent, concentration ratio and pH range.

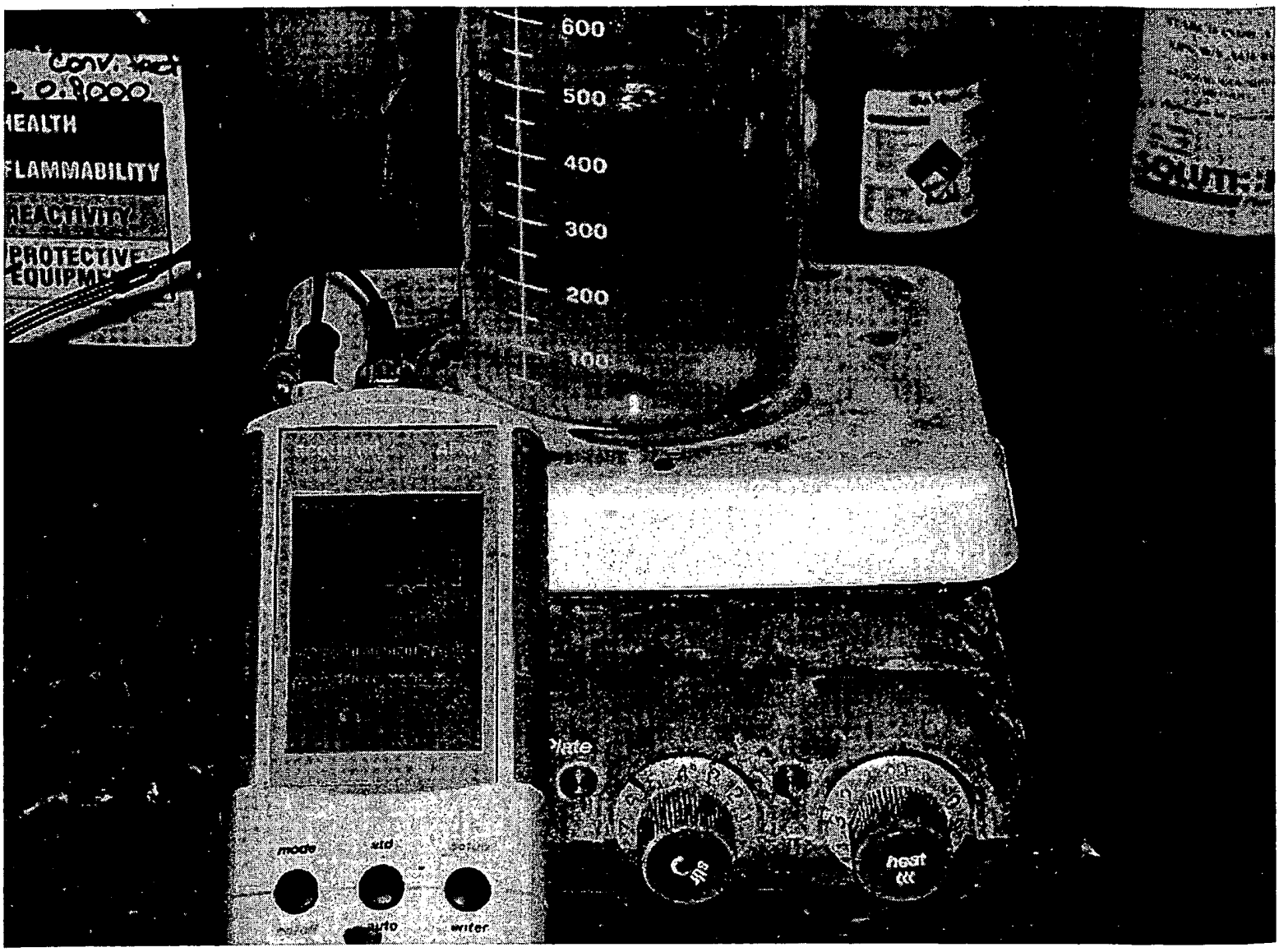
8. I further declare that all statements made in this declaration of my own knowledge are true and that all statements made on information and belief are believed to be true; and further these statements were made with the knowledge that wilful false statements and the like so made are punishable by fine or imprisonment, or both under Section 1001 of Title 18

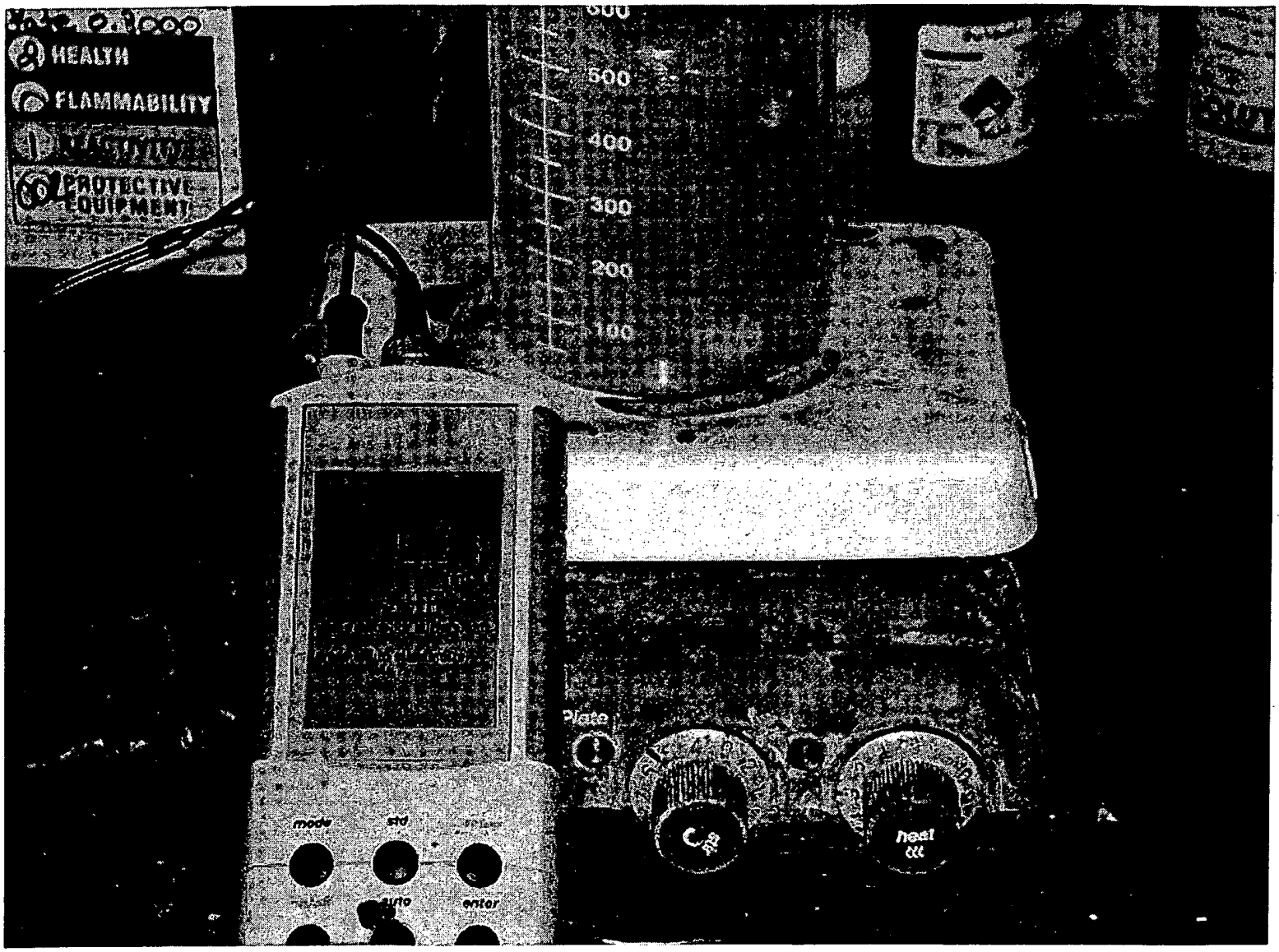
of the United States Code and that such wilful false statements may jeopardize the validity of the application or any patent issuing thereon.

Dated this 22nd day of May, 2006

George Hradil







APPENDIX C -- RELATED PROCEEDINGS APPENDIX

None